

SCIENCE

FRIDAY, NOVEMBER 2, 1888.

THE *Independent* for Oct. 25 has an interesting article by President Gilman on 'The Future of the Johns Hopkins University.' It is the settled purpose of that institution, for the future as in the past, to maintain a collegiate or undergraduate course of study, and also a system of university or post-graduate courses. The college students come mostly from Maryland. The post-graduate students are from all parts of the country, but President Gilman thinks that in the future they will come more and more largely from the South. The university is now in most departments very well organized, but two professorships of great importance—philosophy and English—are still unfilled. Professor Hall, who was to have been the head of the philosophical department, has been called to the presidency of another institution, and his place has not yet been supplied. The search for a professor of English literature, too, has not yet been successful; for the authorities of the university want a man like Matthew Arnold or James Russell Lowell, and such men are not easy to get. Strenuous efforts are making, however, to fill both these positions, and every one will hope that the right men may be found. Mr. Hopkins, as is well known, left a large sum to found a hospital, with the intention that the university should establish a medical school in connection therewith. The hospital buildings are now completed, and the university has already established three professorships as the beginning of a medical department. "The only cause for anxiety in the future of the Johns Hopkins University," says President Gilman, "is the suspension of dividends by the Baltimore and Ohio Railroad. The founder gave the university fifteen thousand shares of the common stock of the railroad, and he recommended the trustees in the most explicit terms to keep, protect, and defend this investment." The income from this stock has been about \$150,000 a year, and has been the main support of the university; and, now that it has ceased for a time, there is little to sustain the institution except the tuition-fees and the moderate surplus that has been accumulated in past years. President Gilman suggests that the friends of the university should make up an emergency fund to relieve its present needs, and expresses confidence that such an institution as the Johns Hopkins University "will not long be allowed to suffer for the want of an income." This confidence we believe to be justified; and certainly every lover of learning will hope that a university of so much promise may suffer no check in its useful career.

THE THOROUGHNESS with which statistics are collected under the direction of Col. Carroll D. Wright by the Labor Bureau at Washington is well illustrated in the gathering of the facts in regard to marriage and divorce in the United States, that are to be embodied in a special report that will be ready early in January. The special agents engaged in this work have obtained the figures from every court in the country having divorce jurisdiction. When it is stated that there are more than twenty-seven hundred of these courts, and that the period of investigation extends over the ten years from 1876 to 1886, the magnitude of the work may be imagined. The report in each case will give the ages of the persons divorced, the cause for which the separation was granted, state whether the husband or wife obtained the decree, the number of children, the place of marriage, and the migration of the couple since then. This latter inquiry is made in order to show whether the change of residence was *bona fide*, or merely for the purpose of obtaining a divorce. Statistics showing the length of time the

marriage lasted, and other facts that may tend to throw light on the subject, have also been collected. The number of marriages will be given by counties for the same period, so that the ratio of divorces to marriages may be seen. There will be added a synopsis of the divorce laws of every State, and the statistics of divorces in the principal countries of Europe. No such investigation for original information has ever been made in any country, and there is none in which it could be made. If it were possible for such a force of experts to be organized elsewhere as Colonel Wright commands the services of to make the inquiries, prejudice, red tape, and respect for established institutions, would prevent them from obtaining the information they sought. Americans have reason to feel proud when they remember that nowhere upon the globe is there an organization, public or private, so well equipped for the collection of social statistics as the United States Labor Bureau.

AT LENGTH THERE IS PROSPECT of the speedy erection of a building for the Congressional Library,—for this we suppose we all ought to be truly thankful, in view of the narrow-minded way in which Congress treated the subject at the late session,—but we fear that the edifice will not be one upon which we shall have occasion to waste much pride. This is no reflection upon General Casey, who is hereafter to have full charge of the work, for we believe that he will make the best building possible with the funds at his disposal. The foundations of the building have already been built in accordance with a plan that contemplated a structure ultimately to cost ten or twelve million dollars. The cost of this work and of the necessary excavations has been several hundred thousand dollars, probably more than half a million. Economy requires the utilization of this work, and General Casey has therefore wisely concluded that the plan of the building he will erect shall be substantially the same as that before contemplated, but that he will so manage it by saving upon the cost of material, on ornamentation, etc., as to keep his expenditures within the four million which Congress has appropriated, and to which it has absolutely limited the cost. It is rare that a public building does not cost from twenty-five to fifty per cent *more* than is estimated: to erect a building for seventy-five per cent *less* than the estimated cost will be a task that no one will envy General Casey. And yet there will be a building of some sort completed much sooner than there has been any reason to anticipate. It will afford accommodation to the books and other literary and art treasures now in the Congressional Library, and for those that will accumulate for a few years to come. By the time it is full, there may be in Washington some Congress that can appreciate the value of a great library, and that will be broad-minded and patriotic enough to provide a building suitable for its accommodation, and of such style of architecture that it will not cause an American citizen to blush when he contemplates it.

CENTENARIANS IN FRANCE.¹

M. LEVASSEUR has recently published the result of an inquiry into the number and condition of those who had reached the age of one hundred years, which gives interesting information regarding the extreme limits of human existence, and the proportion of men that attain it. The newspaper account of centenarians frequently ascribing an age of anywhere from one hundred and ten to one hundred and thirty years, and emphasizing details showing remarkable preservation of faculty, is of course utterly unreliable. A slight investigation is often sufficient to show the groundlessness of such pretensions. In 1871, of 37 reported centenarians in Bavaria,

¹ See an article by M. V. Turquan, *Revue Scientifique*, Sept. 1, 1888.

not one was found really one hundred years old. In Canada the census at the same time showed 421 centenarians. Of these, only 82 could prove their citizenship, and of these only 9 were really one hundred years old, while it was probable that a still smaller proportion of the others were genuine centenarians. The 1886 census of France records 184 centenarians,—66 men and 118 women. This number, though not in excess of the usual record, has aroused suspicion, and led to further inquiry.

The reasons for falsification are quite evident. A peculiar and innocent kind of pride; ignorance of their real age; the assurance of being very, very old,—all these, in passing from mouth to mouth, become cases of advanced centenarianism. Upon closer inquiry, of these 184, only 83 stood the slightest investigation; of the remaining 101, many were really very old, but not one hundred years old; and three young persons gave in their answers as a joke. A reference to the birth register showed that 49 of the alleged centenarians were really of the following ages: 1 of 77, 2 of 78, 1 of 79, 1 of 80, 1 of 82, 1 of 86, 1 of 89, 4 of 90, 4 of 91, 6 of 92, 1 of 93, 4 of 94, 6 of 95, 5 of 96, 2 of 97, 2 of 98, and 7 of 99. Of the rest, no reliable information was obtainable.

Of the 83, only 16 showed their baptismal records to the authorities at Paris; the other 67 did not send their records of baptism to Paris (in some cases these were seen at their houses), but produced the less satisfactory evidence of a marriage certificate, etc. Of these 83 (containing an uncertain number of fraudulent cases, no doubt), 31 were men and 52 women. Of the men, 6 had never married, 2 were married, and 23 widowers: corresponding numbers for the women were 10, 1, and 41. Again: 44 were just 100 years old, 16 were 101, 7 were 102, 6 were 103, 5 were 104, 3 were 105, and 1 claimed to be 112 and another 116 years old, yielding an average age of 101 years and 4 months. The veteran of 116 years is reported to be in good health in June last at 118 years. But dismissing this as well as the preceding case, 105 may be regarded as the extreme limit of life in France.¹

The profession of 59 of the 83 was ascertainable: 22 were farmers and laborers, 9 were handicraftsmen, 8 were land-holders, 6 were cooks or domestics, 5 were merchants, 2 were shepherds, and of the other 7, 1 was a teacher, 1 an insurance-agent, 1 a hotel-keeper, 1 a midwife, 1 a widow of a costumer, 1 a widow of a doctor, and 1 a widow of a stone-cutter. They can also be classified as follows: those living in actual poverty, 22; of very limited means, 10; of a modest fortune, 7; in easy circumstances, 6; wealthy, 1; present fortune unknown, but quite limited in means (as can be deduced from their former professions), 37. The fact that so large a proportion of centenarians come from the poorer and the hard-working classes is a striking one, and is borne out by the statistics of other countries. Their habits of life, too, when such information is obtainable, point to a simple, wholesome diet, much outdoor activity, and little care.

Another means of gauging the number of centenarians is by the number of annual deaths of persons of 100 years or more. In the twenty years from 1866 to 1886 the deaths of 1,474 such persons are reported (553 men and 921 women), or about 73 such deaths annually (27 men, 46 women). This justifies the conclusion that about 70 centenarians for France is a liberal if not a maximum estimate, and the every-day reports are greatly exaggerated. The average annual death-rate of centenarians for the years 1855 to 1885 is 87, or 1 to about 15,000 of the population,—a doubtlessly greatly exaggerated account.

A topic of interest to French but hardly to American readers, is the local distribution of the centenarians in the different departments of France. The southern portion, and especially the region bordering upon the Pyrenees, is particularly fruitful of centenarians.

While these statistics serve to correct popular estimates, they are themselves not rigid enough to be accepted as they stand. Many suspicious points still occur: the preponderance of women over men is too great to be capable of a biological explanation; the preponderance of the working-classes may be a sign of ignorance or of mendacity as well as of longevity; and so on. At any rate, the general conclusion seems warranted that there are really very few centenarians to a million souls.

¹ One of these patriarchs stands at the head of five generations, and counts ninety-five children and grandchildren; another has seventy direct descendants.

THE TOPOGRAPHIC MAP OF NEW JERSEY.

MENTION has been made in *Science* from time to time of the topographic maps of different parts of the country, and in particular of the numerous sheets that constitute the 'Atlas of New Jersey.' The seventeen sheets, on a scale of a mile to an inch, and with contours every ten or twenty feet, covering the whole State, have all been issued, and are now followed by two general maps of the State on a scale of five miles to an inch. The first of these gives counties, townships, cities, villages, railroads, and many of the roads, but gives no indication of the topographic relief. The second has the railroads and a small number of towns, and indicates the topography with great nicety by a series of tints of increasing darkness with increasing height. Thus for the first time in this country is the form of one of our States duly portrayed.

The map is a picture that the geographer may lean over for hours with increasing interest. The features of the State are brought out with perfect distinctness. The broad plains of the southern half, where the railroads run along the flat divides between the streams, is shown in the strongest contrast with the rugged highlands of the northern half, where the valleys alone afford highways. The curiously curved ridges formed by the trap sheets of the triassic area appear with their well-marked individuality. The faintly submerged valleys of all the salt-water coast-line are distinctly revealed by the estuary-like form of the lower stream-courses; and all this not merely in outline, as it appears on ordinary maps, but with accurately determined contours, giving the quantity as well as the quality of the form of the State. Besides this, the map is very suggestive in the way of displaying hitherto unsuspected problems, whose very quantities were unknown before. Now they take definite shape, and call for solution. Look, for example, in the southern half of the State, at the general line of divides between the streams flowing into the Atlantic and those flowing into the Delaware, and note not only the great bend, but also the diminution in height of the line at the head of the Rancocas: has this not some connection with the bend of the Delaware from its direct course at Bordentown? See the oblique truncation of Sourland Mountain on a line, that, when extended, leads to the similarly oblique truncation of the Watchung Ridges: is there not some great dislocation responsible for this coincidence? Notice the heavy morainic barrier that bisects the Passaic basin within the Watchung Ridges: the present line of escape for the Passaic from the Great Swamp that lies outside of the moraine must have been adopted since the glacial period. It is only when the relief of the ground is given quantitatively, as by contours, that problems such as these can be discussed satisfactorily: hence the great advance that geography may count upon when accurate contoured and shaded maps are published for other States.

This map of New Jersey recalls a similar one of Scotland, prepared by Bartholomew, with explanatory text by James Geikie, and published in the first number of the *Scottish Geographical Magazine* a few years ago. Professor Geikie did good service to geography in calling attention to the absolute need of good maps, showing the real form of the country that one has to study; and we would gladly repeat and emphasize every word that he says as to their educational value. But there is another curious correspondence between the two cases: Geikie's physical description of the Scottish highlands and lowlands applies with extraordinary accuracy to the northern third of New Jersey. In both, the highlands are distorted and ancient hard rocks, which have been heavily eroded, and whose general upland surface is an old lowland, elevated, and now deeply consumed by valley-making streams. Both highlands are separated from the lowlands that lie south-east of them by a great fracture, with up and down throw on corresponding sides. Both lowlands owe their present moderate elevation not so much to any depression that they have suffered as to the broad wasting-away of their relatively soft rocks; while the hard crystallines of the highlands have wasted more slowly, and still retain much of the height that the lowlands have lost. The ridges that rise above the lowlands, both in Scotland and New Jersey, are beds of volcanic rock that have, like the highlands, wasted slowly, so as to stand up in strong relief above the softer rocks on either side. There are, of course, differences in plenty

between the two regions, but the correspondences are certainly extraordinary.

We shall hope soon to hear that the excellent and practical work of the New Jersey Survey has been appreciated by the school-boards of that State, and that copies of this new topographic map and of the appropriate local sheet of the State atlas have been placed in all the high schools and academies. Teachers could then carry on the modern reform in geographic teaching beyond its simple first step, which involves a map of the school-yard and home town, to the more difficult second step, in which correct maps of larger areas are needed. Until this is generally possible and actual, reform in geographic teaching will not go far beyond the merest elements of the subject. If Professor Cook is as successful in putting the State maps into practical use as he has been in supervising their preparation, we shall owe him a double debt.

W. M. D.

TISSOT'S THEORY OF THE PROJECTION OF MAPS.

THE question as to what projection to select for a certain map is one of great importance to the cartographer. As is well known, the earth's surface cannot be represented on a plane sheet of paper without distorting the lengths of lines, and without altering the size of surface or of angles; and for this reason it becomes the duty of the cartographer to select a projection, or a method of representing the curved surface on a plane, by which the distortions and alterations become as small as possible. Merit is due a French geographer and mathematician, M. A. Tissot, for having first pointed out a method by which this problem can be easily solved. Unfortunately his book, which was published in 1881,¹ is little known, and therefore the necessary process of replacing the old projections, which he has proved to be inadequate, by new and better ones, is making hardly any progress.

The principle which underlies his researches is so clear and simple, that it may be stated here. Tissot assumes an infinitely small circle on a curved surface. If this surface is represented on a plane, the circle assumes the shape of an ellipse, on account of the unavoidable distortion. The great and small diameters of this ellipse are a and b , and their ratio is a measure of the angular distortion, while their product is a measure of the alteration of surface. The ratio between a and the radius of the original small circle, r , is a measure of the alteration of scale. Tissot shows how to compute the length of the axes of this ellipse, which he calls the indicatrix, as indicating the distortion, and how to determine their direction.

This general theory is next applied to the construction of maps. For any law according to which a system of meridians and parallels is constructed, we can compute a and b as functions of latitude and longitude, and thus a means is obtained of studying the distortions all over the surface of the map.

Maps are made to serve various purposes. In many cases it is necessary that a square inch on one part of the map should represent the same area as a square inch on any other part of the map, or, as it is generally expressed, that the areas should be preserved. Projections of this kind are called 'equivalent,' while Tissot introduces the expression 'authallic.' It is evident that every projection in which the indicatrix-ellipse is equal to the small circle, is equivalent. In other cases it is desirable that each small part of a map be similar to the corresponding part of the earth. This is possible only when the indicatrix is a circle; that is, when $a = b$. These projections are called by Tissot 'autogonal,' as the angles are preserved. In still other cases we do not mind an alteration of angle and surface, but wish to preserve the length of lines as much as possible. For this purpose the ratio of a , b , and r must be as near 1 as possible. Tissot calls projections in which angles and surfaces are altered 'aphylactic.'

The problem, according to this, is very simple. According to the purpose for which a map is intended, we choose one of the three classes of projections. It is the task of the cartographer to select the projection for a map so that, if one property is preserved, the others are changed as little as possible. If, for instance, the areas are preserved, the angles must be altered as little as possible.

A projection which has this property is called by Tissot 'perigonal,' while an autogonal projection in which the alteration of surface is a minimum is called 'perihallie.' We have seen that the distortion is a function of latitude and longitude. If, then, a country of limited extent is given, we must study this function over the whole area of the map; and, as there are an infinite number of each class of projections, we are able to select the function so that the unavoidable distortion of one of the elements becomes a minimum.

The last case, that of 'aphylactic' projections, has been treated by Airy in his projection by balance of errors; but the theory of these projections and their application to certain areas has first been given by Tissot. His admirable work must form the basis of all future cartographic work.

The importance of his researches may be understood by his discussion of the distortions of the map of France. The great map of the war department of that country is constructed in Bonne's projection; the map being equivalent, and the maximum alteration of angle being 18 minutes, and the greatest distortion of scale $\frac{1}{388}$. These would have been 10' 30" and $\frac{1}{688}$ respectively, if a more suitable central meridian had been selected; but they would have been reduced to 25 seconds and $\frac{1}{1170}$, if Tissot's principles had been applied.

It is to be hoped that the thorough study of his work will lead to the adoption of better projections than those which are at present in use.

SCHOOL-WORK AND EYESIGHT.

Five Per Cent of Near-sighted Children in an Old, Badly Illuminated and Ventilated School-Building, and only 2.8 in a New, Well-arranged Building. — School Life, according to Dr. Tiffany of Kansas City, has Little or Nothing to do in the Development of Ocular Anomalies.

IN the chapter entitled 'Our School Systems,' which is one of the most interesting and suggestive of all those that will accompany the forthcoming annual report of the United States commissioner of education, the effect of school-work on eyesight will be very fully discussed, chiefly in extracts from the reports of city school superintendents.

Mr. George Howland, superintendent of Chicago schools, says: —

"In the old school-rooms, and we need not go far back for them, the light was often so insufficient, that much harm undoubtedly resulted to the eyes of the children. But in our newer buildings so much thoughtful attention has been given to this subject, that the evil no longer exists there. Pupils, too, have been allowed to study with too little regard to position, and with the object too near the eye; perhaps with the result of myopia in some cases, but by no means, in my judgment, to the extent often charged.

"The oculist is too definite, and too certain in his knowledge. Why should the book or paper always be 'fifteen inches from the eye'? Five feet seven may be the average height of a man, and eight the right number for his boot; but is he to be considered deformed, or a monstrosity, who is five feet six, or who wears a number seven or nine?

"Of over eighty thousand children in our schools, I have never seen one voluntarily take that distance, and have eminent professional opinion that such an enforced rule would work more harm than ever our neglect has done. Nothing will lie so unblushingly as figures."

The following, from the report of the board of education, describes the results of a recent examination of the eyes of the pupils of two of the leading public schools of Memphis, Tenn: —

"The eyes of 681 pupils have been examined. Of these, 588 had perfect sight, 60 had imperfect sight from general causes, and 30 had impaired vision from eye-strain. It is interesting to trace the gradual increase of this form of impaired sight (near-sightedness) from the primary classes, where it is hardly noticeable, to the highest grade, where it reaches fifteen per cent. In this particular my results are similar to those obtained by examiners in this and other countries. But a point which should not be overlooked is this, — that my examinations were confined to pupils in two different school-buildings, each of which may be taken as a sample of its class. The Market Street building has been recently constructed,

¹ *Mémoire sur la Représentation des Surfaces et les Projections des Cartes Géographiques.* Par M. A. TISSOT. Paris, Gauthier-Villars.

and is well arranged, both as to illumination and ventilation ; whereas the antiquated structure on Linden Street is sadly deficient in both of these particulars. Now compare the percentage of near-sighted children in corresponding classes (fourth, fifth, and sixth) in the two buildings, and you will find that while the Market Street school has 2.8 per cent, the Linden Street school has 5 per cent. These figures commend the new building as strongly as they condemn the old, and no stronger plea can be advanced for new buildings, so constructed as to furnish proper illumination and a plentiful supply of fresh air, than is furnished by these figures, which show that nearly double the number of the pupils with impaired sight come from a badly constructed building with poor light and bad air."

In November, 1886, Dr. H. P. Allen of Columbus, O., was appointed by the board of education of that city to examine the eyes of the pupils of the public schools. In his report he says : —

"I examined between Dec. 12, 1886, and June 6, 1887, the eyes of 4,700 pupils of the public schools, as follows : All of the high-school classes, 12 in number ; all of the grammar schools, 72 in number ; all of the primary schools, 24 in number ; and 12 of the B, C, and D primary schools ; making a total of 120 schools out of the 200 of the city. This included all of the children above 10 years of age, with the exception of about 250, who were scattered through the various lower schools. I visited all of the school-buildings, and saw most of the school-rooms.

"The examinations were made chiefly to determine the condition of vision of the children, and find, in cases where vision was defective, the correcting glasses. The work was done in the school-room during school-hours. Each child was examined separately, its name, age, sex, nationality, complexion, color of eyes, condition of sight, and required glass noted at the time. My records indicate the kind of trouble and the condition of sight with sufficient accuracy for all practical purposes, and enable us to draw certain well-defined deductions. The points to which I wish especially to call your attention are as follows : —

"First, The large number and percentage of pupils among the 4,700 with one or two defective eyes, — 1,175 cases, or 25 per cent of all the children examined.

"Second, Those with two defective eyes, — 936, or 20 per cent of all the children examined.

"Third, The increase in prevalence of near-sightedness as we go up the scale from 0 per cent in the D primary schools to 13 per cent in the senior class of the high school, and 17 per cent among the females of the senior class from 0 per cent at the age of 6 years to 11.3 per cent at the age of 17 years, showing the relation of this trouble to increasing age and increasing demands upon the eyes.

"Fourth, The about equal percentage of each of the other defects in the low, intermediate, and high grades, showing their independence of increasing years and increasing demands upon the eyes.

"Fifth, the diminution in the percentage of good eyes as we ascend the scale, from 80 per cent in the D primary to 66.6 per cent in the senior class of the high school."

A similar examination was made during the year, of the eyes of pupils in the public schools of Kansas City and Nevada, Mo., and of the students of the State normal schools at Warrensburg and Kirksville, Mo., and the State universities of Missouri and Kansas, by Flavel B. Tiffany, M.D., of Kansas City, Mo. The results of this examination differ in at least one material respect from those reported from Memphis and Columbus. The most important facts developed, with other matters of interest mentioned by the examiner, are here shown : —

"That perfect vision, perfect eyesight, be enjoyed by our progeny, depends largely upon the recognition of any defect, slight though it may be, in early life, timely correction of the same if possible, and care and proper use of the organ while in the school-room. That many a boy or girl with some anomaly of refraction or accommodation has been allowed to suffer day after day in order to keep pace with his class, and eventually develop more serious conditions or even blindness, is too evident ; whereas if the trouble had been recognized in time, and proper steps taken, much suffering as well as serious consequences could have been averted. The object of these investigations is to ascertain the condition of the eyes of the youth, the effect of use of the organ for near and small objects, and

the final consequences ; and finally, if possible, to correct the evils arising before irremediable damage has been done.

"In our investigations not only myopia but hypermetropia, astigmatism, spasm of accommodation, and strabismus were looked for. Every eye that was not up to the standard of vision (that of twenty-twentieths) was not dubbed myopic. A careful examination was made with the trial glasses, or optometer, and a more accurate diagnosis made. Our results show a much larger per cent of hypermetropia and astigmatism, and spasm of accommodation, than myopia, there being nearly four times as many hypermetropic pupils as myopic. Of the whole number examined, 2,040, in the different grades and schools, 99, or 4.8 per cent, had spasm of accommodation. Now, spasm of accommodation, or simple hypermetropia even, if not corrected by glasses or relieved by rest from near and small objects, is likely to develop into myopia, or possibly intra-ocular disease : hence the importance of these examinations.

"In our examinations the increase of anomaly of refraction as we ascend in the grades is not marked, — in fact, in some schools it seems to diminish, — but this would not be a definite proof one way or the other, since from one examination, as a different set of pupils are examined in each grade and in each school, there is no means of knowing but that those of the higher grades started with the same degree of anomaly in the primary departments as is found in the seventh year of the grammar school or the high school. In fact, it seems to be true that pupils with anomalies of refraction, both myopes and hypermetropes, are closer students and fonder of books and study than the emmetropes or those of perfect vision ; and hence these students remain in school, while many of those with perfect vision drop out before they reach the higher departments. In our examinations we find a greater percentage of anomaly among the normal schools of Kirksville and Warrensburg than any other ; but it does not necessarily follow that this is the result of a longer course of study and closer application with the eyes, although it is conjecturally true. The only way to prove that study is the cause, or otherwise, is to watch the same set of pupils from the primary department up through the different grades, and see if John, Mary, and James, starting at six or seven years of age in the primary department with perfect emmetropic eyes, finally later on develop myopia. In our examinations this can be done, as we have the name in full, color of each eye, present amount of vision, whether there is any hereditary defect or not ; and now, should the examinations be continued and the same pupils called for as they enter the higher grades year after year, a very definite and satisfactory idea can be gained.

"As to the lighting and ventilation of our school-rooms, very little need be said, as so much attention has been given to this subject by our efficient board, that the Kansas City school-room is almost perfection in those particulars. In the Washington School, where we find the largest per cent of defective eyes in the lower grades, I noticed first and second year pupils, for want of room, were crowded into a room calculated for older pupils, and hence the distance between the desk and the seat was too great, as well as that from the seat to the floor, compelling the little pupil to hang, as it were, upon the desk, his feet not touching the floor. This position, of necessity, brought his face too near his book or slate, and hence taxed the power of accommodation of the eyes to a great degree ; and besides, this school, from its location on the north side of the hill, is not so well lighted and ventilated as others. In the Nevada School I found a less degree of anomaly among the same grade of students than in the Kansas City schools. This I attributed to the fact that the school is in a small country town, where the children have more freedom of the field, where they are not crowded so much as our city children are, and perhaps have better ventilated school-rooms.

"There were 2,040 pupils examined, embracing seven different nationalities, besides several of mixed nationality.

"Of the 1,422 Americans, 300, or 21.1 per cent, have some anomaly of refraction.

"Of the 129 Germans, 32, or 24.8 per cent, are affected ; of the 26 French, 5, or 19.2 per cent ; of the 15 Scotch, 3, or 20 per cent ; of the 67 Irish, 20, or 27.8 per cent ; of the 47 English, 8, or 17 per cent ; of the 11 Swedish, 3, or 27.2 per cent ; of the 93 mixed, 22, or 23.6 per cent.

"The Irish, Swedish, and Germans have the highest percentage of affections; the English, French, Scotch, and Americans, the lowest percentage. Out of the whole number examined, 1,162 were girls and 878 boys; 458 had some ametropia (some anomaly of refraction). Of the 1,162 girls, 290, or 24.9 per cent, were ametropic; of the 878 boys, 168, or 19.1 per cent, were ametropic; being a larger per cent of affection among the girls than among the boys.

"Out of the 2,040 pupils, 13, or 0.6 per cent, had strabismus; 94, or 4.6 per cent, were myopic; 202, or 9.9 per cent, were hypermetropic; 42, or 2.06 per cent, were astigmatic; 99, or 4.8 per cent, had spasm of accommodation; and 63, or 3.1 per cent, had latent hypermetropia.

"We find that hypermetropia predominates. If we add latent hypermetropia and spasm of accommodation, saying nothing of astigmatism, of which the majority was hypermetropic, we have 364 hypermetropes to 94 myopes, or nearly four times as many hypermetropes as myopes, or over twice as many as all the other affections taken together. In the table, as seen, all the grades, from the primary through the grammar school, high school, normal school, and university, are represented; but in no instance, excepting the Kansas State University, is there any thing like a gradual increase of myopia or any of the anomalies simply or collectively. In nearly all of the schools there seems to be a higher per cent of affection in the first years; then, a little later in the course, a marked diminution; and then again an increase. Probably many of those having some trouble after remaining in school for a short time drop out, which would account for the diminution; and then spasm of accommodation and latent hypermetropia becoming manifest later on, or perhaps developing into myopia, would account for the increase in this affection.

"School-life, however, as stated above, so far as I can gather by these examinations, has little or nothing to do in the development of these anomalies. That they exist, however, in a much greater degree than is generally supposed, is very evident; and that continuous use of the eyes having these errors of refraction, whether in the school-room or out of it, if not corrected, is sure to have its evil consequences. The importance of a recognition of the existence of these anomalies, of their extreme frequency, and of detecting and correcting them, is obvious enough. We should take into consideration that spasm of accommodation and latent hypermetropia frequently exist, and that these affections often develop into myopia; and if recognized early, and timely treated by rest and glasses, much suffering and irremediable troubles are averted. Cohn and others may have been able, twenty years ago, to trace the development of myopia to badly appointed school-rooms; but here in America our school-rooms are so carefully arranged as to light, seats, desks, ventilation, etc., that we can scarcely attribute to the work in the school-room the cause of anomalies. In a very great degree these errors of refraction are congenital, frequently they are latent, and, if the eyes were not overtaxed by near work, they would never become manifest. The evil arising from work in the school-room is that these errors of refraction are not perceived, and hence not corrected. If the teacher could be made to understand that the little pupils complaining of headache, pain through the temples, and weakness of the eyes, or dimness of vision, arose neither from stupidity nor desire to avoid study, but that these complaints were symptoms of some defect of the organ of vision, or, what would be better still, let a competent oculist carefully examine each child as he enters upon each year of study in the school-work, and his anomaly, if he have any, corrected, anomalies would gradually diminish."

COMMERCIAL GEOGRAPHY.

The Neglect of Native Fruit-Plants in California.

SINCE the settlement of California, its fruit-growing interests have rapidly gained great importance. It is remarkable, that, notwithstanding the economic value of this industry, hardly any attempts have been made to utilize the native fruit-plants; and Mr. H. Semler, who is so well conversant with the flora of California, has done good service in calling attention to the numerous plants that appear well worth being cultivated, and promise to become a source of considerable revenue. He states, that except the seeds

of the nut-pine, which are sometimes used as a dessert, only one or two species of blueberry (*Vaccinium*) are sold, although they are not cultivated. Hardly any attempts have been made to cultivate the numerous native berries. In a recent number of *Petermann's Mittheilungen* he draws attention to a number of these plants.

There is a good Californian raspberry (*Rubus leucodermis*). The European raspberry is cultivated with limited success only in the valley of the Hudson and in New Jersey, although its culture is made difficult by the extreme cold of winter. For this reason attempts were made to cultivate *Rubus strigosus* and *Rubus Occidentalis* (the red raspberry and the thimble-berry). By breeding and crossing these species, the raspberries now in use were obtained. These have been introduced into California, while the native raspberry of that State is neglected, although, even in its wild state, it has a better taste than the wild eastern berries.

In the same way the eastern blackberries and dewberries have been introduced, although two excellent species are native to the Pacific coast. Since the discovery of the 'Lawton' or 'New Rochelle,' numerous varieties of *Rubus villosus* have been cultivated, and plantations of great extent and value are found in California. No attempts, however, have been made at developing *Rubus ursinus*, a native of the Californian coast, which is used by farmers for making jams and jellies; nor has *Rubus pedatus* of the Sierra Nevada, which has small and sweet jet-black berries, attracted any attention.

Gooseberry-culture has so far been a failure in North America. The European varieties degenerate and perish after a few years. A few years since, *Ribes aureum*, a native of Missouri, was cultivated and used as a stock for the European great-fruited varieties. The Californian *Ribes divaricatum* seems still better adapted to this purpose, and with proper culture it will undoubtedly produce fruits that will equal the European varieties in every respect.

The salmon-berry (*Rubus spectabilis*) and the Pacific thimble-berry (*Rubus Nutkanus*) are admirably adapted for making jams. Both have a peculiarly sweet and aromatic taste and very small seeds. They do not keep any length of time, and cannot be transported on account of their softness, but may be preserved, as is now extensively done by settlers in the woods of Oregon and British Columbia. The young sprouts of the salmon-berry are boiled, and are said to be better than spinach.

Besides these, we mention the large currant, *Ribes bracteosum*, which would probably prove a valuable shrub; the *Leña amarilla*, one of the four Californian barberries, which is frequently used in Mexico, but has not attracted the attention of horticulturists; and the Californian vine, *Vitis Californica*, which might be developed just as well as the eastern species of *Vitis aestivalis* and *V. riparia*, which have become the stock of renowned eastern vines.

It would be well if Californian horticulturists would not only direct their attention to foreign products and to endeavors to introduce them into California, but also attempt to cultivate the native plants of their State, many of which might become sources of important industries.

ELECTRICAL SCIENCE.

Improvements in Methods of Manufacturing Storage-Batteries.

MR. MADDEN, in the *Electrical World*, describes some recent improvements in the methods of manufacturing secondary batteries of the grid type. The plates of which these batteries are composed have been made heretofore by pasting by hand a mixture of red lead and sulphuric acid into hourglass-shaped holes in a cast-lead frame. Hand-labor in such work has two objections: it is expensive, and it does not give uniform results. The life of the cell, and its freedom from expensive depreciation, depend to a great extent on a perfect uniformity of condition all over the plate. To attain this, Mr. Madden has devised a machine that pastes the plate automatically, giving a uniform density to the red lead in each hole.

The red lead, mixed with the proper amount of dilute sulphuric acid, is fed to a mixing-screw of varying pitch, working in a cylindrical casing. The pitch of the screw is such that the mass is compressed as it nears an opening which has a length equal to

that of the grid to be pasted. The grids are passed across the opening by rolls, have their cavities filled with the red lead which is being forced out, and then pass between wheels whose distance apart is equal to their thickness, where they are polished, the grids coming from the machine with their perforations filled with paste of an equal density at every point. The different rolls and wheels, and the screw, are geared together, so that their relative speeds are invariable.

The method of manufacturing the support plates, or 'grids,' has also been improved upon. The old method was simply to cast them; and, although the process was a cheap one, yet the plates lacked in strength and density. Mr. Madden has devised a press by which they are formed by hydraulic pressure. Besides the advantages of greater density and homogeneity, giving an improved strength and conductivity, the process allows smaller holes and thinner partitions than can be obtained by casting.

These improvements in manufacture should result in a greatly reduced cost, and in an increased efficiency and length of life. Storage-batteries are just at the point of becoming economical for many purposes, and a moderate reduction in cost and depreciation will turn the balance.

NEW STREET-CAR MOTOR OF THE SPRAGUE COMPANY.— Since the beginning of the year, the Sprague Electric Railway and Motor Company has equipped a number of street-railways with electric-motor cars, some of the installations having been difficult and important. The result of the year's experience has been the adoption of a motor differing considerably in type from that heretofore used, which has been described in this journal. In the new form a single magnetic circuit is used, as in the Edison dynamos, the axle of the car passing through bearings on the yoke. At the other end the poll-pieces are suspended from a cross-piece on the truck by a heavy spiral spring. Another spring below prevents the motor from rising when the motion of the car reverses. The motion is transmitted from the armature to the wheel-axle by two pairs of gears, — one on each side of the car, — one of the wheels in each case being of fibre to deaden all noise. The reduction is 12 to 1. There are two commutators on each armature, — one at each end, — with a single brush for each. The object of this is to have all the brushes on top, where they can be easily adjusted and inspected. It also decreases the wear. The old form of brush consisted of a number of strips of copper riveted together, and set at a slight angle with the commutator bars. This allowed the direction of rotation to be reversed; but there was more or less wear, especially when the armature revolved against the brushes. In the new brush a number of thin laminæ of copper are strung on a rod in a bevelled holder, and bear almost straight down on the commutator, inclining slightly in the direction of motion. When the machine is reversed, the strips are first carried up to the vertical, and then a little past it in the new direction of rotation, until brought up by the inclined sides of the holder. The motors are controlled as formerly, by switches on the two platforms of the car, and the cars are intended to travel in both directions. The whole arrangement is compact, and should be extremely efficient. It is an improvement on the old type of motor, which has been very successfully used.

ELECTRICITY FOR TEMPERING STEEL.— Electricity has been successfully applied for tempering watch-springs and other forms of spring steel, whether in the form of ribbon or wire. The steel is wound on a spool, whence it passes down through a bath of oil. An electric current is sent through the wire, of such strength as to keep it at the proper redness to answer the desired requirements of temper. As the heating is not done in contact with the air, but is entirely beneath the surface of the oil, there is no trouble from blistering, as in the ordinary methods. The final temper is drawn in the same manner, and the wire or ribbon is finished by means of rolls. The process is also applied to a number of springs besides those for watches, including piano-wires. In all cases the process can be controlled to a nicety, both as to the exact temper and its uniformity through the wire.

STANDARDS OF LIGHT.— The committee of the British Association, of which Prof. Vernon Harcourt is chairman, has submitted a report on comparative tests of standards of light. These tests,

made on six classes of standards, have been carried on for four years, and as a result the committee recommends the pentane lamps. Ordinary sperm candles vary, because the sperm is not a definite chemical compound; and the luminosity varies with the composition, and the locality and length of the wick. The flame is also liable to fluctuate. It is difficult to obtain sperm candles perfectly free from oil. Perfectly dry sperm has a comparatively high melting-point, and candles made of such material require a thicker wick; so that candles of the same size made of this material give less light than those formerly accepted as standards. The amylacetate lamps are constant, but their reddish light is against them. The pentane standard is reliable: it has no wick, and the light does not alter with slight variations in the specific gravity of the pentane. In a special series of comparative tests as to the merits of the amylacetate lamp, the pentane standard, and the pentane lamp, the pentane lamp was found almost as good as the pentane standard. Three observers recorded the results, and changed their positions after each set of simultaneous observations. The pentane lamps differed, in a total of 1,118 tests, by 1 per cent in 86 cases, by 2 per cent in 57 cases, by 5 per cent in 19 cases, and in a few instances by 10 per cent. Other tests were made to reduce the platinum unit of M. Viole — the light given off by a square centimetre of platinum at its melting-point — to a practical shape. Platinum-foil with a surface of a quarter of a square inch was stretched over rollers and heated to its melting-point, but the results were too variable to be of value. When wound over steel rollers, the heat was conducted away too rapidly. Experiments with platinum fused by the blowpipe were equally unsatisfactory. The heating of a platinum strip by the current of eight or ten accumulators gave better results, but the platinum is apt to buckle. Other lamps and flames were also tried. Carbon filaments waste, nor would the action of photographic rays on sensitive-plates lend itself to standard tests. The committee therefore recommends the pentane standard and also the pentane lamp.

EFFECT OF ELECTRIC CURRENTS ON PLANTS.— Prof. E. Wollny of Munich has experimented on the effect of electric currents of different intensities and characters on the growth of plants. Small plats of about four metres square were provided, and were separated by plates penetrating twenty-five centimetres into the soil. On the two sides of one of these beds, plates of zinc were sunk, the dimensions being thirty centimetres by two metres. They were connected by an insulated wire, with five Meidinger cells in the circuit. Another enclosure had an alternating current constantly sent across it, while in a third there were simply buried a copper and zinc plate connected above the earth by an insulated wire. The three enclosures were therefore subjected to different conditions, — to a weak direct current, to a comparatively strong direct current, and to an alternating current. Several specimens of grain, potatoes, carrots, etc., were planted, and were subjected to the action of the currents until they reached maturity. Comparing them with plants grown under ordinary conditions, the result to which Professor Wollny is led is, that electricity, whether under the form of continuous currents of different intensities or of alternating currents, exerts no influence on the vegetation of plants.

HEALTH MATTERS.

Depressed Areas as Health-Resorts.

DR. WALTER LINDLEY of Los Angeles, Cal., contributes to the *New York Medical Record* an interesting paper on the effect upon invalids and others of compressed air below the sea-level. He says that in the eastern part of San Diego County, about one hundred miles from Los Angeles, is a depression traversed by the Southern Pacific Railroad, known to geographers as the San Felipe Sink, but commonly called, on account of the innumerable shells spread over its surface, the Conchilla Valley. This basin is about one hundred and thirty miles in length by thirty miles in average width. The deepest point is about three hundred and sixty feet below sea-level.

In this valley live about four hundred of the Cohuilla Indians. This is an interesting tribe. Dr. Stephen Bowers, in a paper read before the Ventura County Society of Natural History, March 5,

1888, said that he believed them to be of Aztec origin. They are sun and fire worshippers, and believe in the transmigration of souls, and that their departed friends sometimes enter into coyotes, and thus linger about their former habitation. They practise cremation. Their principal article of food is the mesquite-bean, which they triturate in mortars of wood or stone, after which the meal is sifted; and the coarser portion is used as food for their horses and cattle, and the finer is made into cakes for family use. Dr. Lindley found, on a visit here, asthmatics, rheumatics, and consumptives, all of whom reported wonderful recoveries. Some of these stories he accepted *cum grano salis*, which quotation is, by the way, especially applicable to the salt-fields. These asthmatics and consumptives claim that the farther they get below sea-level, and the dryer the atmosphere, the easier they breathe. The rheumatics claim that the heat and dryness improves the circulation, and thus relieves them. Dr. Lindley did not stay long enough to make any trustworthy observations; but he thought, that, aside from dryness — mean annual relative humidity certainly not over twenty-five — and equability, there was considerable atmospheric pressure at a point three hundred and fifty feet below sea-level, and that there was here moderately compressed air on a large scale. In a recent paper on the use of the pneumatic cabinet, the author, from many cases in practice, showed that compressed air relieves asthmatics and cases of phthisis. He says the compressed air will gradually force its way into every part of the lung, in order that the pressure may be the same on the inside as on the out. While the proportion of oxygen is, of course, not increased, yet there is an increased quantity in a given space, and we really have the oxygen treatment here on an extensive scale.

In connection with his paper, Dr. Lindley adds an interesting note in which he gives the following list of other places below sea-level: "Sink of the Amorgosa (Arroyo del Muerto), in eastern California, two hundred and twenty-five feet below sea-level; the Caspian Sea, eighty-five feet below sea-level. Lake Assal, east of Abyssinia in the Afar country, eight miles long and four miles wide, is about seven hundred and sixty feet below sea-level. Its shores are covered with a crust of salt about a foot thick. This salt is a source of revenue to the Afars, as they carry it by caravans to Abyssinia, where they find a ready market. There are several other depressions about six hundred feet below sea-level in this vicinity. The noted oasis Siwah, in the Libyan desert, three hundred miles west of Cairo, is one hundred and twenty feet below sea-level. Here are beautiful date-palm groves, and here also the apricot, the olive, the pomegranate, and the vine are extensively cultivated. In this same desert is the oasis Araj, two hundred and sixty-six feet below sea-level. There are also numerous other depressions in the desert portion of Algeria and at various points on the Sahara Desert."

Garbage-Cremation.

Our readers who are interested in garbage-cremation will find an excellent paper on this subject in the *Journal of the American Medical Association*, Oct. 13, 1888. The author of the paper is Dr. J. Berrien Lindsley of Nashville, Tenn. Dr. Lindsley is the treasurer of the American Public Health Association, and has made the cremation of garbage a special study. The difficulties connected with the disposition of a city's refuse may be imagined from the following statistics which he gives:—

Baltimore, August, 1887, estimated by police census, had a population of 437,155. The amount of night-soil delivered at the dumps for the year ending Dec. 31, 1887, was 51,107 loads, or 10,221,400 gallons. Probably more than half the inhabitants use water-closets, which carry off an equal amount. The dead animals, etc., removed during the same year were:

Total number of dead animals.....	25,249
“ “ “ “ fowls.....	9,074
“ “ “ “ fish.....	23,574
“ “ “ cartloads of dead fish, vegetable and other offal removed from vari- ous docks.....	1,067
“ “ “ pounds of decayed meat condemned.....	1,495
“ “ “ dozens of eggs condemned.....	607

Richmond, population 100,000. The report of contractor for removal of garbage, or kitchen refuse, year 1887, shows total number of loads carried off, 2,680 = 72,200 bushels.

Memphis, population 62,335. Number of loads of garbage removed in 1887 was 29,120.

In this country the experiment of destroying garbage by means of a furnace constructed especially for that purpose was first tried on Governor's Island, New York harbor. A description of this garbage-cremator was given in the *Sanitary Engineer* of Aug. 13, 1885, by Lieutenant Reilly, at that time acting assistant-quarter-master, United States Army.

In the twelfth volume of 'Public Health,' containing the reports and papers presented to the American Public Health Association, at the Toronto meeting, October, 1886, may be found a paper by Dr. George Baird of Wheeling, giving an account not only of the destruction of garbage, but also of night-soil, by means of a furnace contrived by M. V. Smith, M.E., Bissell's Block, Pittsburgh, Penn. In the 'Report on the Sanitary State of Montreal, for the Year 1886,' will be found an interesting narrative in this connection, giving instructive details as to cost, showing the extent of the work to be done, and the complete success of the refuse-crematories, and also of the night-soil crematories constructed by Mr. William Mann. Dr. Louis Laberge, health-officer of Montreal, read an elaborate paper on this topic at the meeting of the American Public Health Association in Memphis, last November, which will be found in the thirteenth volume of 'Public Health,' now in press. The *Sanitary News* of Nov. 19, 1887, states that at Des Moines, Io., a small Engle furnace is in experimental use, and is working very satisfactorily. At Pittsburgh a Rider furnace has just commenced its service. In Chicago a Mann furnace was being constructed. In the same journal, March 17, 1888, may be found a full description of the Chicago garbage-crematory, from which a duplicate of the plant could be built if desired. On April 14 it reports that the said crematory is doing good service in disposing of about fifty tons of material a day. The *Sanitary News* of March 10, 1888, reports the success of the disposal of garbage by cremation at Milwaukee.

HEALING OF WOUNDS.—Prof. Leon Le Fort believes that the impurity of the air has no injurious effect upon wounds, and that it may be ignored. He believes that wounds will successfully heal if perfect cleanliness is maintained by the surgeon, as to his person, and every thing used by him in his operation.

LEAD-POISONING.—Dr. Herald of Newark, N. J., has, during the past six months, had fifty cases of lead-poisoning in his practice, which he has traced to soda-water contained in the five-cent patent-stopper bottles. In some of the stoppers examined by him he found 42.4 per cent of lead, and in others 83.6 per cent. The action of the carbonic acid in the water upon the lead in the stopper ultimately produces a bi-carbonate of lead, which, when absorbed from the stomach, causes lead-poisoning.

POTATO-POISONING.—A large number of soldiers were recently poisoned while on duty at one of the French fortifications. It is believed that the solanine in unripe potatoes was the cause of the sickness.

ETHNOLOGY.

The Laws of Marriage and Descent.

AT the recent meeting of the British Association, Dr. E. B. Tylor read an interesting paper on the laws of marriage and descent, illustrative of his ingenious method of studying ethnological phenomena. All myths and customs, on a close study, may by analysis be disintegrated, and are found to consist of certain elements. Dr. Tylor arranges these elements statistically, and, by inquiring which occur simultaneously among various peoples, proves that certain groups of such elements belong genetically together. This he calls the method of adhesions. The results thus obtained are of the greatest importance from a psychological as well as from an historical standpoint. As a test of the results to be obtained by this means, he examines the custom which forbids the husband and his wife's parents, although they may be on a friendly footing, to speak or look at one another, or mention one another's names. Some seventy peoples practise this or the converse custom. On classifying the marriage rules of mankind, Dr. Tylor found that the avoidance custom between the husband and the wife's family belongs preponderantly to the group of cases where the husband goes to live with

his wife's family. This happened in fourteen cases, while if distributed by chance it would have happened in eight cases only. This implies a causal connection between the customs of avoidance and residence, and suggests as a reason, that the husband, being considered an interloper in the wife's family, must be treated as a stranger, or, as we should say, "he is not recognized."

The custom of naming the parent from the child prevails among more than thirty peoples: thus Moffat was generally known in Africa as Ra-Mary, or father of Mary. This custom proves, on examination, to adhere closely to those of residence and avoidance, the three occurring together among eleven peoples; that is, more than six times as often as might be expected to happen by chance occurrence. The connection of these customs finds a satisfactory explanation in the accounts given of the Cree Indians, where the husband lives in his wife's house, but never speaks to his parents-in-law till his first child is born. This alters the whole situation; for, though the father is not a member of the family, his child is, and when he receives a new name, meaning 'father of the new-born child,' the whole is brought to a logical conclusion by the family recognizing him as soon as he takes this name.

Dr. Tylor has inquired into the two great divisions of human society, — the matriarchal and patriarchal, or, as he prefers to call them, the maternal and paternal systems. In the former, descent and inheritance follow the mother's side, and the guardian of the children is the maternal uncle, not the father, whose assertion of paternal rights belongs to the paternal system with descent and inheritance on his side. The problem to be solved is, which of the two systems is the more primitive? Former inquirers have judged that the maternal system is the earlier; but Dr. Tylor is the first to give a firm basis to this theory by showing numerically that frequently customs of the maternal stage survive in the paternal, while no instance of the reverse is known. The author believes that a chief underlying cause of both these systems is still traceable in society. His tables show that among 65 peoples the husband attaches himself permanently to his wife's family; among 76 such, temporary residence is followed by removal to a paternal home; and in 151 cases the paternal home is resorted to from the first. The changes brought about by the man ceasing to be in the hands of his wife's kinsmen, and becoming lord of a household of his own, he considers as the cause of transformation of maternal into paternal society.

These results of a comparatively limited application of Dr. Tylor's ingenious method prove that it is pre-eminently adapted to the study of human institutions and inventions, and will undoubtedly prove a great help in the study of the history and development of mankind.

DISCOVERY OF FLINT IMPLEMENTS AT SOUTHALL, ENGLAND. — In the May number of the Proceedings of the Geologists' Association, John Allen Brown describes the discovery of the greater portion of a mammoth associated with human relics under circumstances of more than ordinary interest. The geological formation of this district being well known, the author was able to ascertain with a reasonable degree of exactness the probable origin of these remains, particularly the circumstances under which the carcass was deposited, and how it happened that its immediate neighborhood proved to be so rich in human relics. He shows that either the banks of a large river of the past must have existed near the spot, or the rising ground of an island in the stream. The mammoth either drifted into the shallow, tranquil water close to the bank, or was driven into the clayey silt of the shore, in which its remains were found by the paleolithic hunters who have left us so many of their implements as evidence of their presence in this locality at the time. The occurrence of so many implements at about the same level is indicative of an old inhabited land surface in their immediate vicinity, especially as most of them show little effect of rolling with the stones of the gravel, and have not been carried far, if removed at all, by the stream. A spear-head found in contact with the bones leads directly to the conclusion that it had actually been used, with others, for hunting the animal or cutting into its flesh. At any rate, it seems difficult to avoid the inference that there is an historical connection between the remains of the elephant and the implements found in such close proximity to them. The subsequent alteration in the currents, and probably in the channel of

the stream, by which these interesting relics of the remote past were covered up, tells the same tale of old habitable land surfaces, inundated, eroded, and destroyed, and new ones formed, which is noticeable all over the Thames valley.

BOOK-REVIEWS.

A Handbook to the Land-Charters, and other Saxon Documents.
By JOHN EARLE. Oxford, Clarendon Pr. 12°. (New York, Macmillan.)

THIS book will be very valuable to students of the early history and institutions of England. The author's name is sufficient guaranty for the general accuracy of the work, and the selections here gives have both historical and philological value. They are mostly grants of land, either from the King in council or from some subordinate authority; some of them being made to individuals, and others to religious houses. The land of the Teutonic settlers in England was at first divided into three portions: one being assigned to individuals, and made hereditary in their families; another given to townships as a corporate possession; while the third remained the property of the nation, under the name of 'folk land.' It was from this last portion that the grants here dealt with were made, subject always to the three burdens of military service, repair of bridges, and repair of fortresses. The greater part of the extant documents are grants to religious bodies, owing, as Mr. Earle remarks, to their having a better chance of preservation. The great importance of such title-deeds, and the difficulty in early times of detecting spurious ones, led to the forgery of many; and Mr. Earle gives examples of these of a real date subsequent to the Norman Conquest, but professing to be centuries older. The greater part, however, of his selections are genuine documents, and their historical importance is obvious. He has not confined himself, though, to land-grants, but gives examples of wills, contracts, and other papers of interest. They are all written either in mediæval Latin or in Anglo-Saxon, or more often in a mixture of the two; and, as an aid to their study, the author gives a glossary of the Saxon words, and of such Latin words as require elucidation.

In his introduction, Mr. Earle treats the general form and character of the charters, and then takes up the subject of land-tenure in those early times, discussing particularly the origin of the lord of the manor. The old theory of Blackstone and others was, that the lord was the original owner of the soil, and that some of his tenants succeeded in acquiring a customary right to the lands they held of him, which afterwards developed into a legal right. On the other hand, the historical school maintains that the township, or village community, was the original land-owner, and that the manorial lords of later times were usurpers. Mr. Earle's view is different from either of these. He holds that there was from the very first settlement of the Germanic tribes in England a class of military chieftains known at first as *gesithas*, and afterwards as *thanes*, one of whom was, as a rule, attached to each township. They were commissioned officers of the King, having military and police duties to perform, and wielding a certain authority over the township for that purpose. They were in no sense proprietors of the town lands, but had certain land of their own in the neighborhood; and it was these officers who afterwards developed into the lords of the manor. This theory is not free from difficulties, as the author himself recognizes; but it is certainly plausible, and well deserves the attention of historical students.

Tenure and Toil. By JOHN GIBBONS. Philadelphia, Lippincott. 12°. \$1.50.

THIS work is another of those attempts, now so common, to cure all the ills of the body politic. Mr. Gibbons is impressed with the evils that flow from poverty and the unequal distribution of wealth, as well as with those attending the conflicts of labor and capital; and, like many other persons, he exaggerates them till they appear of portentous dimensions. Those evils, he thinks, arise from "the false relations existing between the people and the land, and between labor and capital;" and the remedy for them "can be found only in legislation." The remedies he proposes, however, are for the most part such as have been proposed by others, and those that are new do not strike us as either wise or adequate to

their purpose. He is a firm upholder of the right of property, in land as well as in any thing else; but he would limit the amount of land that a man might own. In reply to the objection sometimes urged against land-reformers, that men will often refuse to take land even when they can get it for nothing, he proposes that men without means of support shall be compelled to go and settle on the public lands in the West, the government to advance them the necessary capital to begin farming with, the same to be paid for by them in instalments. He would have arbitration by State officers between labor and capital, but would not compel the parties in dispute to accept their decision. He recommends some minor measures in the interest of the laborers, and favors profit-sharing and co-operation. The combinations of capital known as 'trusts' he regards with strong dislike, and would have them all abolished by law. Such are the principal measures he proposes, and, except the one about the public lands, they contain little that is new. The real defect in them, as in so many others that have been proposed, is that they overlook the moral and intellectual causes to which the evils complained of are so largely due, and which cannot be removed by legislation. We should add that a considerable part of Mr. Gibbons's book is taken up with a history of the institution of property, which is not always up to the standard of the best scholarship, as, for instance, when he cites the early chapters of the Pentateuch as historical authority. Indeed, the whole book gives the impression that the author either lacks the ability or has not taken the trouble to master his subject.

Inebriety: its Causes, its Results, its Remedy. By FRANKLIN D. CLUM, M.D. Philadelphia, Lippincott. 12°. \$1.25.

THE author states in his preface that "the object of this book is to give a clear, correct, and impartial description of drunken frolics, their consequences, and how to avoid them. The subject is treated from a scientific standpoint, and the drunkard is pictured in colors that are true to life. His habits, his diseases, his misfortunes, his miseries, are described exactly as we find them, and the easiest and best way to cure and reform him is made known so simply and clearly that all can understand."

With the habits, diseases, misfortunes, and miseries of the drunkard, we imagine that the readers of this book are as familiar as its writer, and we therefore pass these subjects by; but in the cure and reform of the inebriate every one is interested; and if, as Dr. Clum states in his preface, he has found a way of accomplishing this, he has done humanity a great service, and doubly so if that way is an easy one. Of his ability to accomplish this transformation he is evidently thoroughly convinced. In addition to the quotation already made, he further says, "The most confirmed and degraded drunkard can be reformed if the directions given in this volume are carefully carried out. They can be carried out by even the most poverty-stricken man, if there is an honest desire in his heart to reform."

The author's method of reforming the drunkard may thus be concisely described. The first object to be obtained, in all cases, is the personal consent of the inebriate to assist in his own reformation. He should carefully think the matter over, until there is no lingering doubt in his mind about the injury alcoholic drinks are doing him. He should understand the reasons, and all the reasons, why they are not good for him. Then he should avoid the thoughts, the persons, and the places that lead to the temptation to drink, and frequent the places, associate with the persons, and indulge in the thoughts, that lead away from the temptation. He should keep busy at something that will occupy his close attention, and not become discouraged and give up the struggle, even though he should break his resolution time after time. When the resolution has been broken, he should carefully think the matter over until he understands why he failed, so that he may be on his guard against a recurrence of the same circumstance. Dr. Clum especially insists upon the treatment of drunkards as matter-of-fact men, and not as if they were the most demoralized, sinful, and abandoned of men; nor, on the other hand, must they be treated as if they were objects of great pity. They will listen to philosophical reasoning, to plain, unvarnished truth, but despise trickery and hypocrisy. After intoxicants have been discontinued, steps should be taken to restore the inebriate's health, and his surround-

ings should be made sanitary. His occupation and residence may often be changed with advantage. The views of the author, which we have endeavored to give in a condensed form, are, of course, fully elaborated in his book. He gives some sound advice to the moderate drinker as well as to the confirmed drunkard, warning him that he is in danger. He should remember that he has the same failings, passions, and frailties as other men, and is subject to the same physiological laws, disappointments, sorrows, and diseases, and that it is absolutely impossible for a moderate drinker to tell with certainty whether he will become a drunkard or not. His only safety is in avoiding intoxicants *in toto*.

One chapter of Dr. Clum's book is so remarkable, that, although we have already extended our consideration of his views more than we had intended, we must take a moment to refer to it. In the chapter referred to, which is headed 'The Inebriate Drunkard's Guide,' the writer gives advice to the drunkard, so that while he continues his habit he may do so with the least injury to his health, and thus prolong his life. Whatever may be thought of the wisdom of this, Dr. Clum recognizes, that, despite all warnings, protestations, pleadings, and tears of friends, many persons will continue to indulge in alcoholic drinks. The rules which he lays down for the guidance of such persons are as follows: 1. Alcoholic drinks, especially strong spirits, should not be taken on an empty stomach; 2. Light, dry wine, beer, or ale should be drunk in preference to strong spirits; 3. Whenever disease exists, those wines should be used which will create the least mischief, as, in gout, sherry or madeira instead of hock and claret, or the best quality of light California wines; 4. Champagne should be preferred as usually the safest; 5. Liquors should not be mixed. Other advice follows in reference to bathing, and the care of the body and its functions. The author is evidently aware that some persons may be tempted to make use of the directions which he gives to continue the evil habit, and at the same time to minimize its effects; for he says that it is to be hoped that those who have just started on their career as drunkards, and are not fully initiated in the mysteries of Silenus, will not attempt to follow these rules with the intention of being moderate drinkers, thinking to escape the disastrous effects, the terrible penalties, and the fearful evils of drunkenness. Moderate drinkers engaged in business calling for judgment and acumen, end, with scarcely an exception, as financial wrecks, however successful they may be in withstanding the physical consequences of their indulgence. From a careful perusal of Dr. Clum's book, we infer that he believes that an inebriate may be cured if he is determined to reform, but that without this determination any attempt at reformation will be a failure.

Hand-Book of Moral Philosophy. By HENRY CALDERWOOD. 14th ed. London and New York, Macmillan. 12°. \$1.50.

THE sale of fourteen thousand copies of Professor Calderwood's 'Moral Philosophy' is pretty good evidence that it contains something of real value, and all who have read the book will agree that this is the case. It is not, and does not profess to be, a great original work, laying down a new theory of our moral nature or of moral truth, but only a compendium of the best ideas of the intuition school; and as such it is a decided success. It is much superior to the ordinary ethical text-book, especially in depth and closeness of reasoning. The author, too, though decided in his own views, is eminently fair in representing those of his opponents, and often keen and able in criticising them. The present edition of the 'Handbook' is largely rewritten, especially the chapters dealing with the basis of morals, and those in which the author criticises the Hegelians and the evolutionists. The chapter on the 'First Cause,' too, is enlarged, which, from a literary point of view, seems a mistake, as introducing matter not strictly ethical; for, though duties to God must obviously be treated in an ethical work, the subject of the divine existence and attributes belongs to another branch of philosophy. On the other hand, some topics are not accorded the space they deserve, the chapter on 'Impulses to Action,' for instance, being by no means so full and elaborate as would be desirable. On the whole, however, the work deserves its reputation, and we are glad to see it appearing in a revised form, better adapted to the wants of the present time.

Professor Calderwood's philosophy, as we have already remarked,

is the intuitional; and the largest and best portion of his work is devoted to setting forth the intuitional theory of conscience and the moral law, with criticisms of opposing views. In so doing he reveals both the strength and the weakness of his own position. The grand defect in the utilitarian ethics has always been its failure to account for the sense of obligation; and Professor Calderwood has no difficulty in showing that all their attempts to derive this sentiment by association or evolution from the lower feelings of our nature have thus far been unsuccessful. In discussing the views of the Hegelians and Neo-Kantians, our author has the same difficulty that others have in understanding what they mean by 'self-realization,' and how this can be made the basis of moral conduct. Professor Calderwood's own theory, however, has in our eyes a defect hardly less momentous than those he points out in the others; namely, its failure to reduce the moral law to one fundamental principle. Our conscience, he says, knows intuitively that we ought to be industrious, truthful, temperate, and so forth; but each of these is given as a distinct and independent law, having no connection with the rest. He maintains, indeed, that all the various moral laws are in perfect harmony with one another; but, if this is the case, there must be some deeper principle on which that harmony depends, and this principle must be the fundamental moral law. It is obvious, however, that a purely intuitional ethics, which rejects all reference to ends, can never supply such a principle, but we must look for it in some other direction.

Western China: A Journey to the Great Buddhist Centre of Mount Omei. By Rev. VIRGIL C. HART. Boston, Ticknor. 12°. \$2.

THE author of this interesting description of western China and its temples and sceneries is so well versed in the Chinese language, and so well acquainted with Chinese customs, that his book cannot fail to be full of material of the greatest interest. During a twenty-two years' residence in China, more particularly in the central parts of the empire, he has acquired a thorough knowledge of the religion of the Chinese, and therefore his descriptions and explanations of the great religious centre in western China are full of interest to the student of Buddhism. In 1887 the author was appointed to visit western China and re-open a mission at Chung King, which had been destroyed by a mob. After re-establishing the mission, he made a visit of a month's duration to Mount Omei, which is one of the great centres of Buddhist worship. It is the adventures of this journey and his observations on Mount Omei which the author describes in his book. The produce of the districts he visited, and the mode of life and the trades of the inhabitants, as well as the wonderful scenery of the gorges of the Yang-tse, are the subjects of the author's interesting descriptions. But the reader will be especially attracted by his observations on the wonderful works of art in this region. The author says, "Here, near the borders of Chinese civilization, we find a region of unequalled sublimity, a combination of lofty mountains, of swift rivers, of valleys of wondrous fertility. Then, also, of the works of man there are many, such as thousands of brine-wells, a great silk-culture, of which it is the centre, a white-wax industry, mountains chiselled into the forms of idols, colossal bronze statues, pagodas, and one temple wholly of rich bronze." Valuable translations of Chinese inscriptions found in these regions make the author's descriptions still more interesting, opening, as they do, a view upon the ancient history of this district, and upon the state of mind in which the pilgrim gazes at these works of religious devotion.

Elementary Classics. London and New York, Macmillan. 24°. 40 cents each.

THREE new volumes of this useful series have reached us. Rev. G. H. Nall has edited 'Stories from Aulus Gellius,' with notes, exercises, and vocabularies for the use of lower forms, and intended as a pleasant change to young boys after a course of 'Cornelius Nepos,' and 'Eutropius.' The language of the original has been simplified in part, and some rare or late words and constructions have been cut out. Rev. H. M. Stephenson has edited the fourth book of the 'Æneid' on the same plan as the ninth, which was published a short time ago. The third volume of the series are selections from Xenophon's 'Anabasis,' Book IV., edited by Rev. E. D. Stone, and accompanied by an historical introduction, notes, exer-

cises, and a vocabulary. This special portion has been selected as a record of hardihood and adventure likely to be of special interest to boys.

Talks on Psychology applied to Teaching. By A. S. WELCH. New York and Chicago, E. L. Kellogg & Co. 16°.

THE present little volume has been written from an educational point of view, its object being to give a review of psychology as applied to teaching. Many instructors in our common and graded schools are familiar with the branches they teach, but deficient in knowledge of the mental powers whose development they seek to promote. The teacher, however, must comprehend fully not only the objects studied by the pupil, but the efforts put forth in studying them, the effect of these efforts on the faculty exerted, and their result in the form of accurate knowledge. These have been the leading considerations in determining the character and scope of the book. The first part of the book is a brief summary of psychological data, while the second contains their special application to teaching-purposes.

A First Book in German. By H. C. G. BRANDT. Boston, Allyn & Bacon. 12°. \$1.

THE present volume is the first part of Brandt's 'German Grammar,' bound together with 'The Student's Manual of Exercises,' prepared and arranged by A. Lodeman to accompany the former. Thus a book is obtained that is well adapted for use in secondary schools. The first part is an unaltered reprint from the fourth edition of the grammar, which is very concise and clear. Accidence and syntax are completely separated. The syntax is treated to a certain extent from an historical standpoint. Although in the first part only brief remarks on this subject are found, they will interest the pupil. The present partial edition has been prepared at the suggestion of teachers, and will undoubtedly prove very useful.

Macmillan's Greek Course. London and New York, Macmillan. 16°.

MR. H. G. UNDERHILL has compiled a series of 'Easy Exercises in Greek Accidence,' and Mr. W. Gunion Rutherford has used the occasion to prepare a new edition of his 'First Greek Grammar,' which, in its general arrangement, remains as the former editions, although it has been thoroughly revised and partly rewritten. The first part of the grammar is a drill-book for beginners, "more accurately compiled than those generally in use," while all advanced matter is confined to a second part. The grammar, in its original form, gained many friends, and it has become still more useful in its revised form, and by the addition of the collection of exercises by Mr. Underhill, of which it is the starting-point.

NOTES AND NEWS.

THE committee on science and the arts, of the Franklin Institute of Pennsylvania, is empowered to award, or to recommend the award of, certain medals for meritorious discoveries and inventions. These medals are (1) the Elliott Cresson medal (gold), founded by the legacy of Elliott Cresson of Philadelphia; and (2) the John Scott legacy premium and medal (twenty dollars and a medal of copper), founded in 1816, by John Scott, a merchant of Edinburgh, Scotland, who bequeathed to the city of Philadelphia a considerable sum of money, the interest of which should be devoted to rewarding ingenious men and women who make useful inventions. Upon request made to the secretary of the Franklin Institute, Philadelphia, full information will be sent respecting the manner of making application for the investigation of inventions and discoveries.

— In his annual report, Surgeon-General Moore says of the health of the United States Army that the mean strength of the army for the year, including officers and both white and colored enlisted men, is stated at 23,841, of which 21,601 were whites and 2,240 were colored. The total admissions to sick report were 29,727 (white, 26,600; colored, 3,127); ratio of all admissions per 1,000 of all mean strength, 1,231.42 white, and 1,395.98 colored; deaths from all causes, 188 white, 26 colored, — total, 214; ratio of deaths per 1,000 of mean strength, 7.88 white, 10.71 colored, — total 8.12. The death-rate was somewhat lower than the rate for the previous decade, which was 11.4. The death-rate of the

army of the United States continues to be higher than that of any foreign armies, except the British and Italian. The principal causes of deaths were pneumonia and shot-wounds.

—Dr. William Osler, professor of clinical medicine in the University of Pennsylvania, has been appointed physician to the Johns Hopkins Hospital, and professor of medicine in the Johns Hopkins University. Dr. Osler took his degree in the McGill University, Montreal. He subsequently studied in London, Berlin, and Vienna, and in 1885 was appointed Gulstonian lecturer in the Royal College of Physicians, London, and in 1886 Cartwright lecturer in the College of Physicians and Surgeons, New York.

—Prof. Simon Newcomb has gained great benefit from his sojourn at Chelsea Hospital, and has now gone to Asheville, N.C., accompanied by his daughter, for the purpose of enjoying the fresh mountain air there.

—Major J. W. Powell, at the meeting of the Philosophical Society of Washington last Saturday, read a paper on 'The Laws of Corrasion,' explaining their methods of operation under various conditions; Prof. E. B. Fernow also read a very important paper on 'The Influence of Forests upon Quantity and Frequency of Rains.' The full text of the former, which is a very important discussion of a law first definitely announced by Major Powell in his letter to the New Orleans Chamber of Commerce, and a full abstract of the latter, will be published in early issues of *Science*.

—The wisdom of the policy of Surgeon-General Hamilton in establishing a camp of refuge for persons fleeing from points infected with yellow-fever is amply vindicated by the record of Camp Perry. The following despatch from Dr. Hutton, who is in charge of the camp, gives some interesting facts: "Oct. 20: To-day completes two months at Camp Perry; 810 refugees from infected points have been received; 721 have been discharged; 25 cases of fever developed; 1 death Sept. 9; not a case contracted in camp. Our 60 unacclimated employees, 5 of whom have been two months in fever-camp, not a single case of fever of any kind among them. Not a known case of fever reported from the 721 cases discharged and scattered to all parts of the country. In view of these facts, how any sanitarians can consider Camp Perry as an infected place is incomprehensible. Drs. Faget and Posey of New Orleans, Guitéras, and Geddings give this their emphatic indorsement."

—Messrs. James W. Queen & Co., Philadelphia, have just issued a new catalogue of chemical apparatus. In this they have omitted reference to old and obsolete forms, and endeavored to make a catalogue the most complete and useful ever issued in this country. The catalogue will be mailed to any address on the receipt of fifty cents. The firm has added to its manufacturing facilities, and is prepared to make all kinds of scientific apparatus. Their facilities for making platinum ware are especially to be noted.

—The autumn meeting of the American Oriental Society in Philadelphia, Wednesday, Oct. 31, was the first to be held in that city, the society accepting at its May session the invitations extended on behalf of the University of Pennsylvania and the Oriental Club of Philadelphia. On Wednesday, at 3 o'clock P.M., the society met in the chapel of the University of Pennsylvania; and on Thursday morning and afternoon, in the hall of the Historical Society. The following is a list of the papers read: 'Report on the Exhibit of Oriental Antiquities of the Cincinnati Exposition,' by Cyrus Adler; 'On a New Testament Manuscript, Peshito Version, dated A.D. 1206, with a Text of the Traditions of the Apostles,' by Isaac H. Hall; 'A New Vedic Text on Omens and Portents,' by J. T. Hartfield; 'Qualitative Variations, in the Calcutta and Bombay Texts, of the Mahabharata,' and 'On the Later Puranas (in Sanscrit Literature),' by E. W. Hopkins; 'A New Reference in the Avesta to "the Life-Book" Hereafter,' by A. V. W. Jackson; 'On Transposed Stems in the Babylonian Talmud,' by Marcus Jastrow; 'On a Fragment of the Grammatical Works of Abu Zakariyyah Hajjug,' and 'On Symbols of the Sun-God and the Word *Kuduru*,' by Morris Jastrow, jun.; 'On a Samaritan Hebrew Manuscript in the Library of Andover Seminary,' by George F. Moore; 'On Rome Assyrian and Babylonian Royal Prayers,' and 'The Pantheon of Assur-banipal,' by D. G. Lyon; 'Remarks on

the Arabic Dialect of Cairo,' by C. H. Toy; 'The Babylonian Caduceus,' and 'A Babylonian Cylinder from Urumia,' by William Hayes Ward; 'Note on the Arch of Chosroes,' by Talcott Williams. Reports were read on 'The Collection of Oriental Antiquities recently deposited in Washington,' by one of the curators of the National Museum; and on 'The Recent Purchase of Cuneiform Tablets for the University of Pennsylvania,' by a member of the Chaldean Exploration Party.

—The Colorado Ornithological Association has been re-organized under the title of 'Colorado Biological Association.' Its objects are the detailed investigation and recording of the fauna and flora of Colorado, recent and fossil. Annual reports and special bulletins will be issued. The former are to contain a full bibliography of the published records for the State during the year. Mr. T. D. A. Cockerell of West Cliff, Custer County, is secretary of the association.

—Benjamin B. Chamberlin, who has recently died, was born at Keeseville, Me., March 13, 1831. He was the son of the Rev. Parmalee Chamberlin, a Methodist clergyman, formerly well known in New York. After leaving school, he was apprenticed to Benjamin J. Lossing, then an engraver in New York, and subsequently went to Cincinnati to embark in business for himself. About 1865 he returned to New York. While in Cincinnati he turned his attention to collecting, his first hobby being medallions; and after his return to New York he took up the study of minerals, making a specialty of collecting those of New York and vicinity. For this work he had exceptional facilities, as the Fourth Avenue improvement was then in progress, and blasting was going on in many parts of the city now built over. He leaves one collection at the Nyack Library. His foreign collection he sold recently to Mr. Edward Pearson for the new school at Clouland, N.J. He had been ailing for some years, but his death, which occurred at the home of his brother-in-law, Mr. E. H. Cole, at Nyack, on Oct. 13, was very sudden. At noon he had a severe hemorrhage, and at half-past two passed away, almost without a struggle. The cause of his death is believed to have been rheumatism of the heart. He was buried at Nyack Cemetery, Oct. 16.

—Mr. John Gilmer Speed has become the editor of *The American Magazine*. Mr. Speed was for several years managing editor of the *New York World*, before it was purchased by its present proprietor. Since then he has spent much time in foreign travel, and has also been a frequent contributor to the magazines and newspaper press. He has written a life of John Keats, and edited his letters and poems. In conducting the magazine, it is Mr. Speed's purpose to make it all that its name implies,—an illustrated monthly, representative of American thought and life. —E. and F. N. Spon announce as in preparation, 'A Treatise on Masonry Construction,' by Ira O. Baker; 'Metallic Alloys,' by W. T. Brannt; 'Notes in Thermo-dynamics and Steam-Engine Experiments,' by Prof. C. H. Peabody; and 'A Practical Treatise on Modern Printing Machinery,' by F. J. F. Wilson and D. Grey. —A. & C. Black, Edinburgh, will publish this month the twenty-fourth and concluding volume of the 'Encyclopædia Britannica,' which has been under way nearly ten years. A general index to this encyclopædia is also in press, and may be looked for some time next year. —Arrangements are being made, it is reported, with the sanction of the German Emperor, for the publication of an English translation of the 'Reminiscences of Ludwig Schneider,' who was for twenty-six years the reader, secretary, and confidential friend of the Emperor William. Schneider's diaries were regularly revised by the Emperor every year, and his book is a work of great interest and importance. He accompanied the Emperor throughout the campaigns of 1866 and 1870-71, and one of the most interesting passages is his Majesty's own account of the battle of Rézonville. —Much of the genuine value of the *Atlantic* lies in the terse, clean-cut, and vigorous articles on American history by John Fiske, the latest of which is entitled 'The Eve of Independence.' Mr. Fiske's historical articles are worthy of the highest praise. Lillie B. Chace Wyman continues her 'Studies of Factory-Life;' Miss Murfree, her serial story entitled 'The Despot of Broomsedge Cove;' and William Howe Downes, his papers on 'Boston Painters and Paintings.' William Roscoe Thayer con-

tributes an article on 'The Makers of New Italy,' and John Trowbridge writes on 'Economy in College-Work.' — The issue of *The Youth's Companion* for November contains the article, written expressly for that periodical by Mr. Gladstone, on 'The Future of the English-Speaking Races.' — *Outing* for November contains, besides other notable features, the commencement of a series of articles on the 'Outdoor Life of the Presidents,' from the pen of John P. Foley; and the 'Progress of Athletism,' by Charles Turner. — The November *Century* begins the thirty-seventh volume and nineteenth year of the magazine; and the number is made notable by the beginning of several new series, or magazine 'features.' The most important of these is the first instalment of *The Century* 'Gallery of Old Masters,' engraved by T. Cole, and described by W. J. Stillman and by Mr. Cole himself. The engravings in this series were made in the presence of the original pictures themselves. They are actual copies, and unique in the history of art; for such careful copies have never before been made on wood. Another series begun in November is Mr. Cable's 'Strange True Stories of Louisiana.' After a preface by Mr. Cable himself, comes the extraordinary story of 'The Young Aunt with White Hair,' from an old French manuscript. Among the leading contributions to this number are instalments of the 'Life of Lincoln' and of George Kennan's papers on the Siberian exile system. The guilds of the city of London are described by Norman Moore. Other contributions include 'Bird Music: The Loon,' by Simeon Pease Cheney; 'Mammy's Li'l Boy,' a negro dialect crooning song, by H. S. Edwards, illustrated by E. W. Kemble; 'Memoranda on the Civil War;' Open Letters by George Kennan, Rev. T. T. Munger, Richard Hoffman, and others; etc.

— Dr. John C. Branner, in the first volume of the Proceedings of the Lackawanna Institute of History and Science, gives an interesting sketch of the effects of glaciation in the Lackawanna-Wyoming region, his principal object being to attract special attention to a detailed study of these phenomena. He also publishes a list of localities at which glacial striæ have been observed in that region, for the guidance of those who may take up the work where he was obliged to leave it on being appointed director of the Geological Survey of Arkansas.

— The Boylston medical prize of four hundred and fifty dollars has been awarded by Harvard University to Dr. George H. F. Nuttall of San Francisco, for a dissertation entitled 'A Contribution to the Study of Immunity.'

— The *Journal of Economics* for October opens with a paper by James Bonar on the Austrian economists. Their principal work has been on the theory of value, which they profess to present in an entirely new light; but Mr. Bonar shows that their view, though expressed in new terms, is not so different from that of the English writers as they seem to suppose. Their discussion of 'subjective value' is in his opinion their principal contribution to economics. Another theoretical article is that by Stuart Wood on 'A New View of the Theory of Wages.' The author starts with the fact that in some employments a certain work can be done either by labor or by capital; and from this he deduces the law that in such cases the price paid for a given amount of labor will be equal to the interest on the capital that can be substituted for it. Then the rates of interest and wages thus established will also prevail in all other employments. According to this theory, wages depend on interest; but what interest itself depends on, the author neglects to say. Professor Dunbar's paper on Alexander Hamilton shows that in his sinking-fund scheme, and in establishing the Bank of the United States, Hamilton followed English precedents, though with some variations; but that his plan for establishing the national credit on a firm basis was so comprehensive and so successful as to entitle him to rank as a great financial statesman. The article on 'The Australian Tariff Experiment' is a comparative exhibit of the effects of free trade in New South Wales and of protection in Victoria. The general outcome is to show that manufactures have prospered as well in the free trade colony as in the protected one, while in commerce and in growth of population the former has taken the lead. Wages are essentially the same in both; so that in this case, at least, protection has not raised wages. The acts given in this paper have been published in different forms

elsewhere; but, in the present state of our own tariff question, this new presentation of them will attract attention, and doubtless be useful.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Dream Excitation.

THE direct influence of slight sense-stimuli upon the flow and make-up of our dream consciousness is a well-known fact, which can be proved by artificial experiment (see MAURY, *Le Sommeil et les Rêves*, p. 132, etc.), but which it is difficult to confirm under ordinary circumstances, since we seldom waken after a well-marked dream experience in time to catch the stimulus, or without altering the stimulus by movement, etc. On the night of Oct. 22 I had a dream which perfectly fulfilled the conditions of this experiment. I fell asleep about eleven o'clock, and found myself with a companion in a wood, watching a number of wood-cutters at work. After looking at them for some time, one of the workmen drew my attention quite suddenly by giving forth a strange sound, half musical and half speech, by which he seemed to be trying to express something to his neighbor; and the sound came with every blow of his axe in regular rhythm. The sound seemed to me distinctly familiar and yet very strange, and I turned to my friend and said, "What an apology for conversation!" Just as I spoke, I awoke, and the sound of the peculiar tone of a clock down stairs striking twelve broke in upon my consciousness. The four remaining strokes of the clock preserved exactly the rhythm of the wood-chopper's axe; and not only so, but the sense of familiarity which had puzzled me in the dream was relieved with a glow of pleasure as I recognized the sound of the clock.

This experience illustrates also the remarkable swiftness with which new sensations are assimilated to the character of a previous dream consciousness. Before the clock began, the men were simply cutting, without order or distinction. But when the sound broke in, it was at once *accommodated* to the scene by important modifications. One workman is singled out: he begins to ply his axe in the regular time of the clock-beats, and to give forth a sound which preserves in its general character the peculiarities of the real sound. Now, since I experienced in the dream no less than four beats, as the rhythm was perfectly established and clear in my consciousness, and there remained four beats after I awoke, this whole accommodation must have taken place in the interval between the first and the fifth beat (for it was then twelve o'clock). I have since measured the interval between the strokes of the clock, and find it to be two seconds. The whole time from the first to the fifth beat was therefore eight seconds. From this should be taken the time occupied by the dozed state between dreaming and waking, — say, at least one interval of from two to four seconds. There remains a period of four to six seconds as the time of accommodation. This may be called, in a very rough way, the reaction time for a complex case of constructive imagination; for the constructive imagination is nothing more than the free play of images in forms of ideal composition, due to the influx of additions from the sensorium. There is no direct way of measuring this time in the waking state, since the attention interferes with the process.

MARK BALDWIN.

Lake Forest, Ill., Oct. 23.

Chemical Action between Solids.

APROPOS of Messrs. Spring and Hallock's controversy (*Science*, xii, p. 184), I think that the re-actions between silica and the metallic oxides at temperatures far below the melting-point, not only of both components but even of the silicate itself, have generally been regarded as occurring directly between solids. When certain mixtures of lime and silica are strongly heated, though there be not the slightest indication of fusion, yet some chemical action seems to occur, for the silica now separates in the gelatinous state when acted on by hydrochloric acid (PERCY, *Fuel*, p. 46, 1875).

HENRY M. HOWE.

Boston, Oct. 28.